Towards an Integrated Water Quality Toolbox

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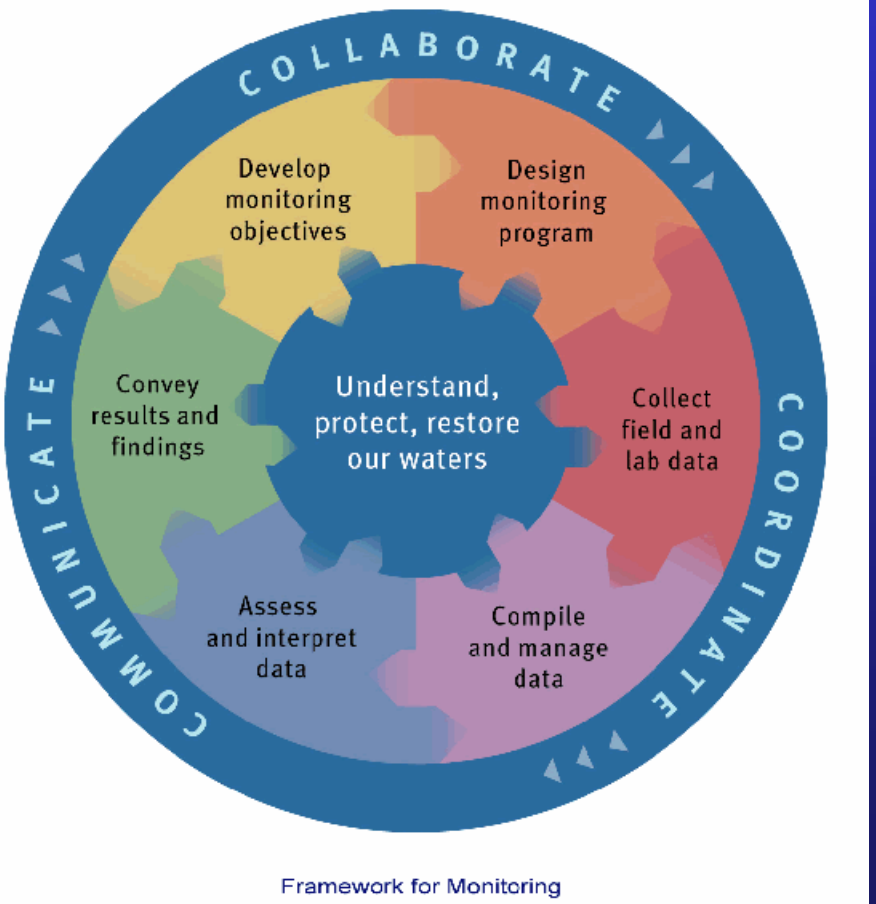
Framework for Monitoring and Assessment



Framework for Monitoring

Why a Framework??

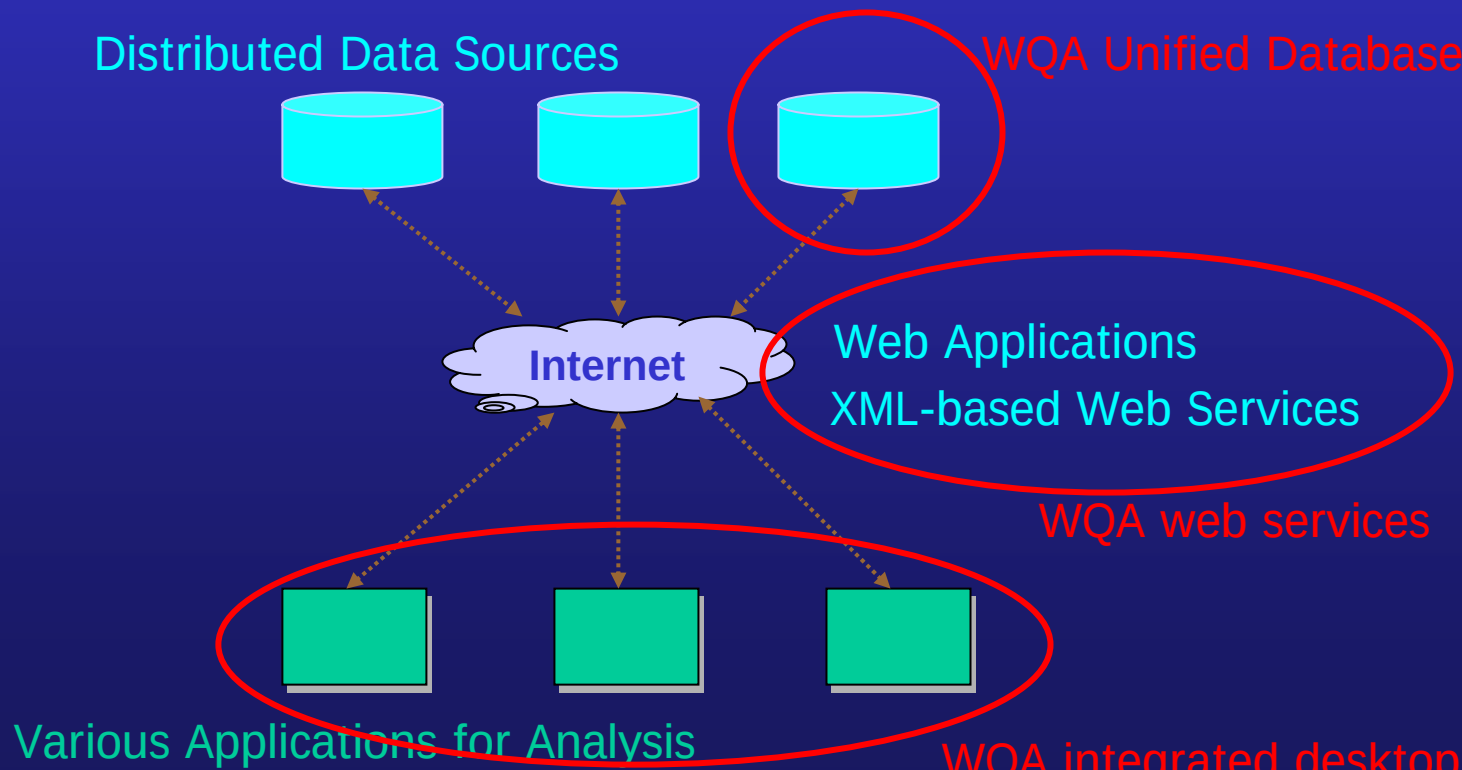
- Multiple Agencies
- Various Practices
- Various Database Technologies
- Various Analytical and Presentation Techniques

Framework for:

- Collecting and Storing Data
- Using Data

Framework for Access and Analysis

Framework = Medium + Suite of Tools = WQA



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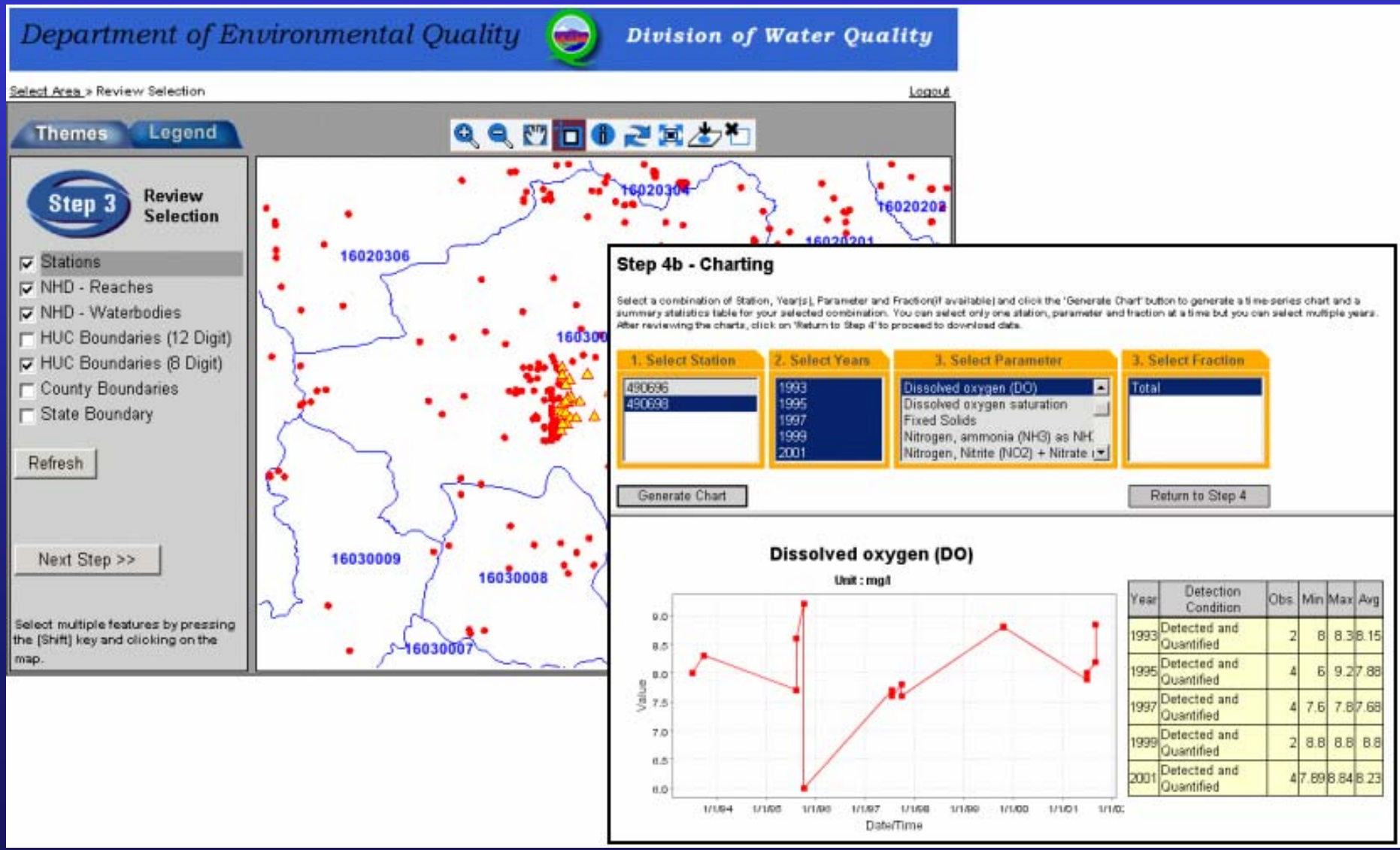
WQA Background

- Some of the projects that led to the conceptualization of WQA
  - Utah Data Assessment and Integration Tools to Support TMDL Development
  - Impairment Analysis for Southwest Florida Watersheds
  - Water Quality Exceedance Analysis for El Paso, Colorado

Project: Utah Data Assessment and Integration Tools

- Objective
  - Provide Utah DWQ staff easy access to water quality data to support TMDL development
- Background
  - Utah Modern STORET database
  - EPA BASINS and spreadsheet-based tools for TMDL development
- Key Development Milestone
  - UDAIT Web Application

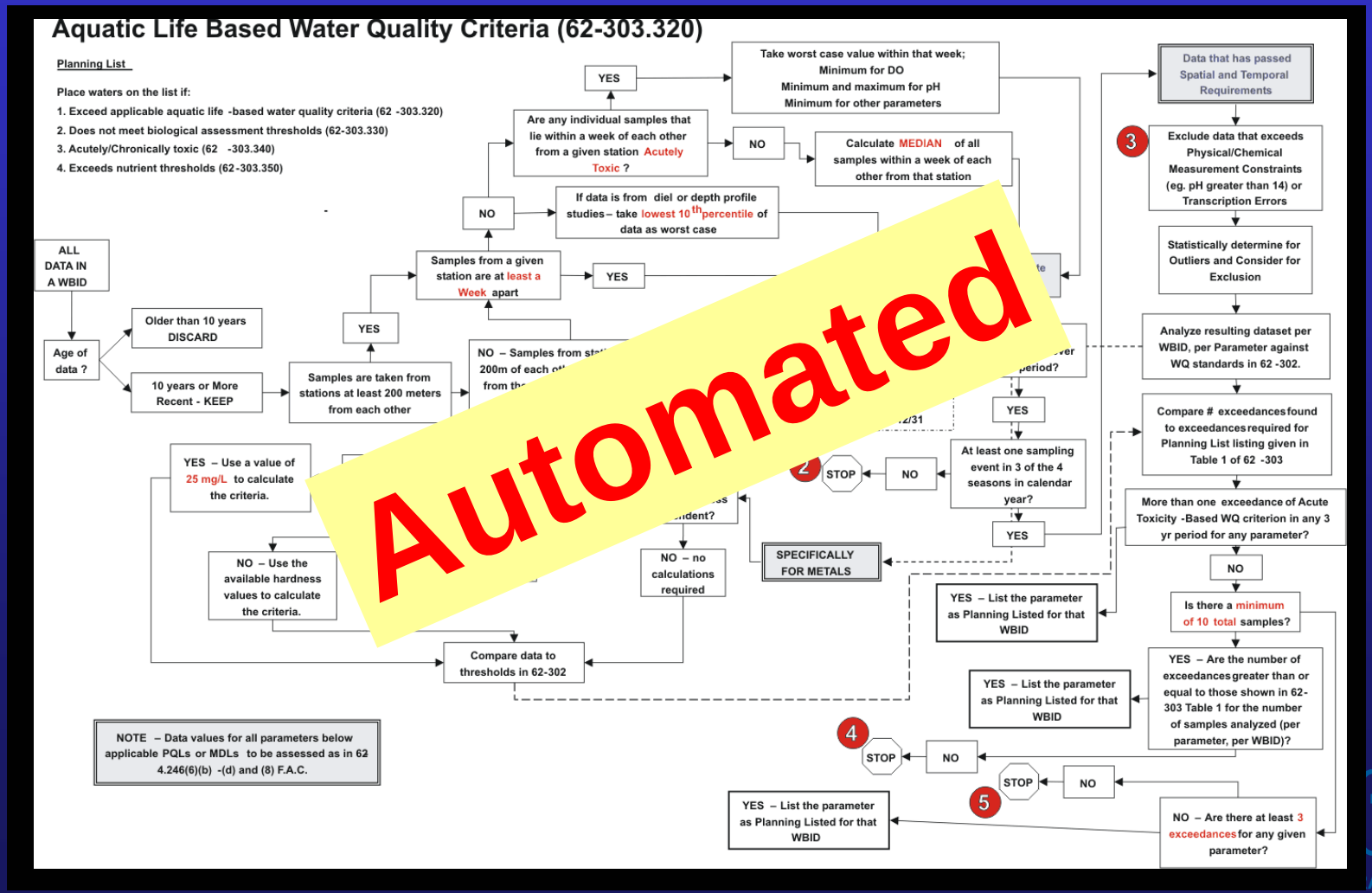
Project: Utah Data Assessment and Integration Tools



Project: Impairment Analysis for Southwest Florida Watersheds

- Project Objective
  - Determine waters of concern within the South Florida watersheds.
- Background
  - Multiple data sources
  - Complex Florida Impaired Waters Rule
- Key Development Milestone
  - Automating impairment analysis

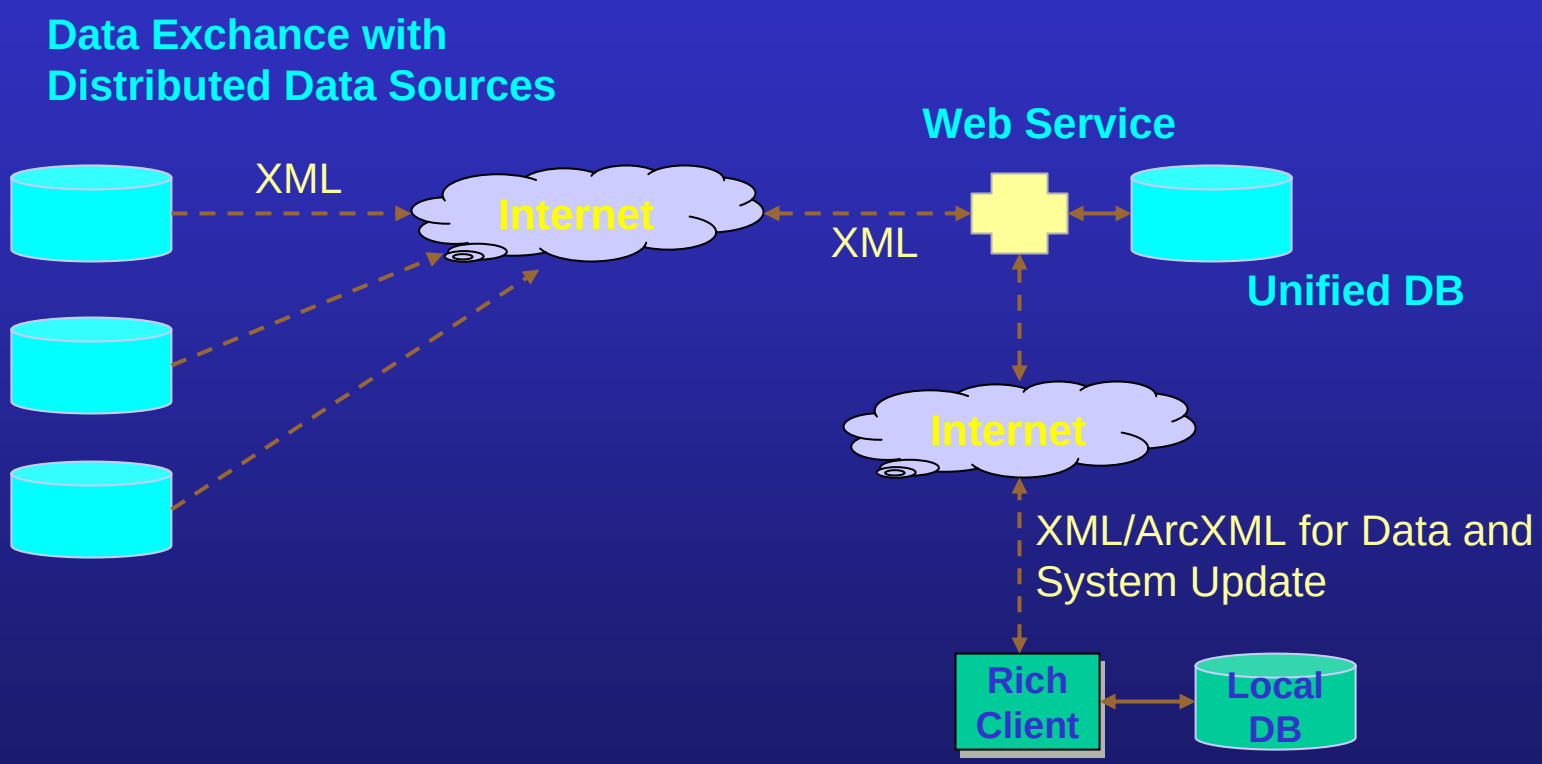
Florida IWRule for Aquatic Life Based Criteria



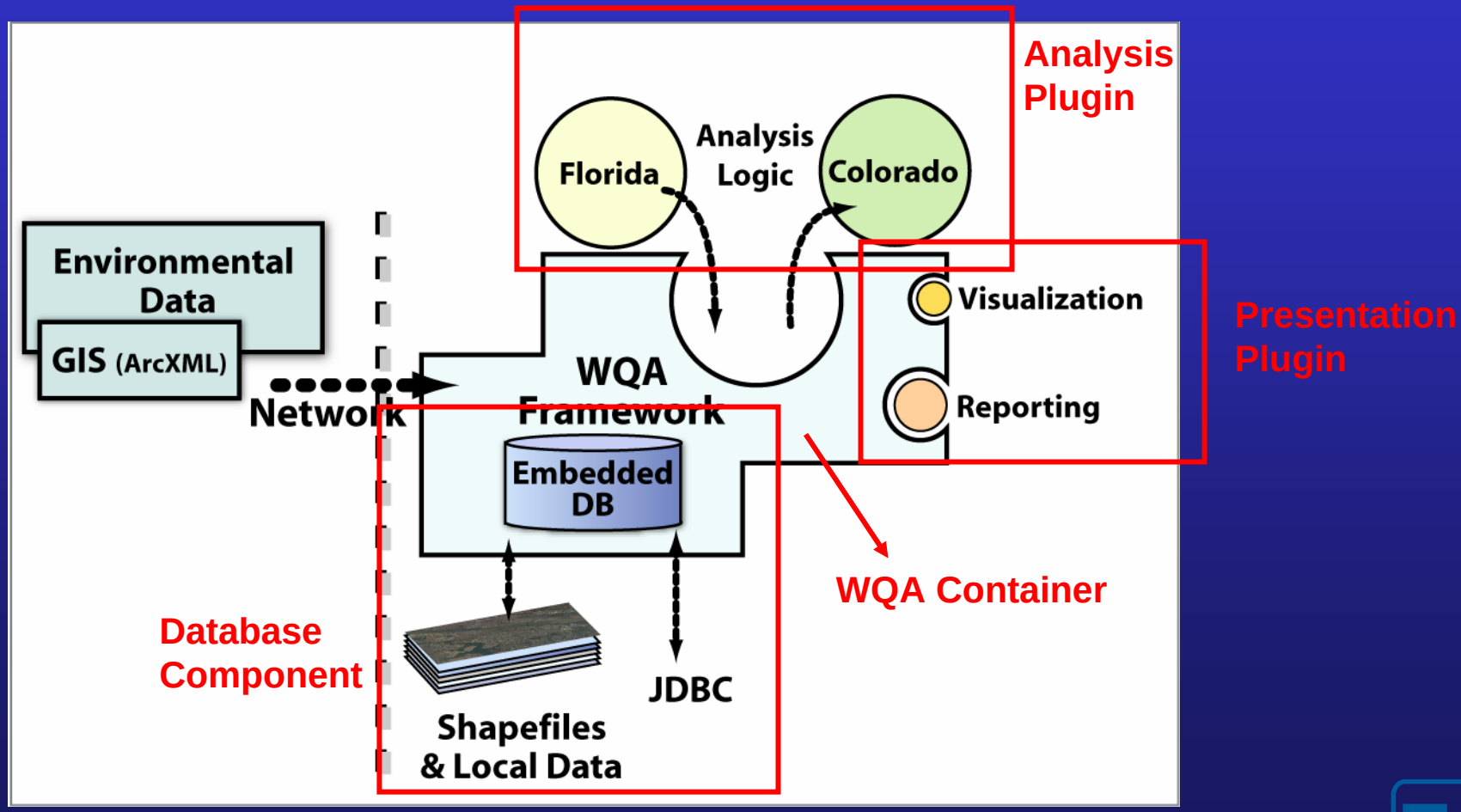
Project: Water Quality Exceedance Analysis, El Paso, Colorado

- Objective
  - Determine water quality exceedances at monitoring stations within El Paso county using State of Colorado Water Quality Criteria.
- Background
  - EPA HQ modern STORET database
  - Yet another set of standards and rules for analysis (compared to Florida)
- Key Development Milestone
  - Desktop application to provide local copy of data for a particular project (GIS, standards, water quality data)

WQA Conceptually

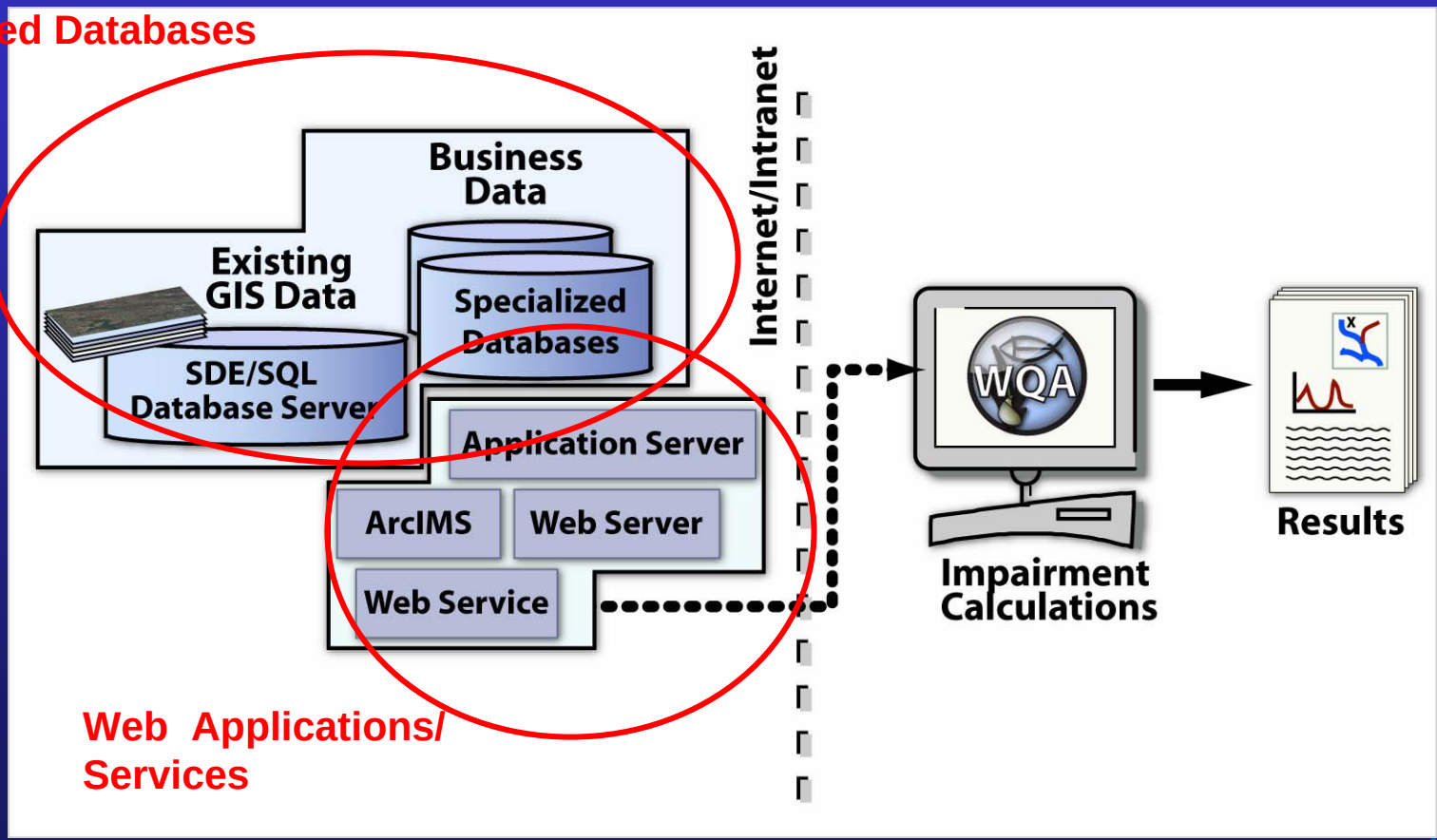


WQA Client Application - Components



WQA Server Side Components

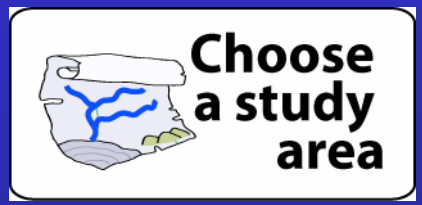
WQA Unified DB and Distributed Databases

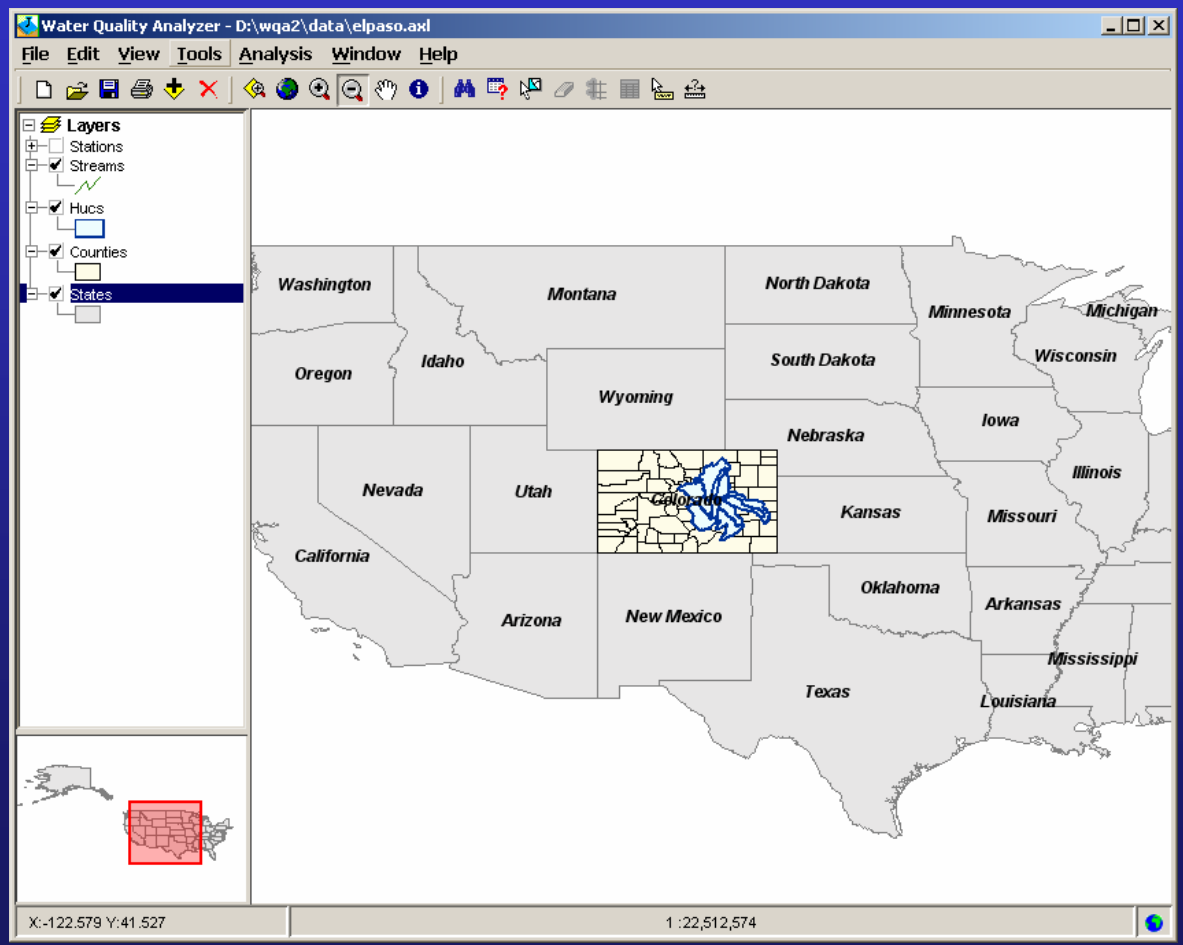


WQA Technologies

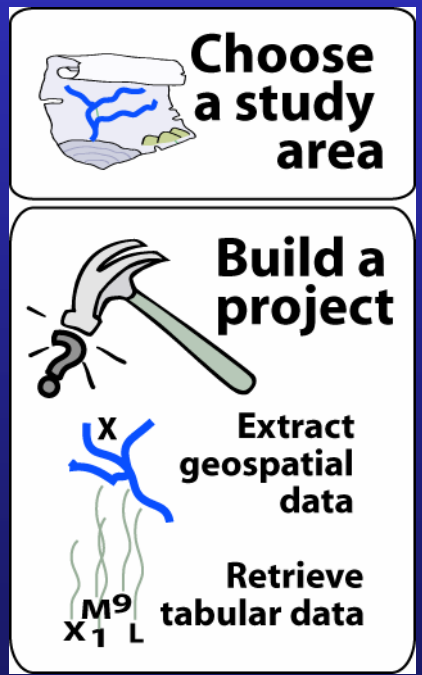
- WQA Unified Database
  - Oracle 9i
- Web Services
  - Microsoft .Net
  - ArcIMS 4.1 ArcXML Web Services
- Rich Client
  - Map Objects Java Edition 2.0

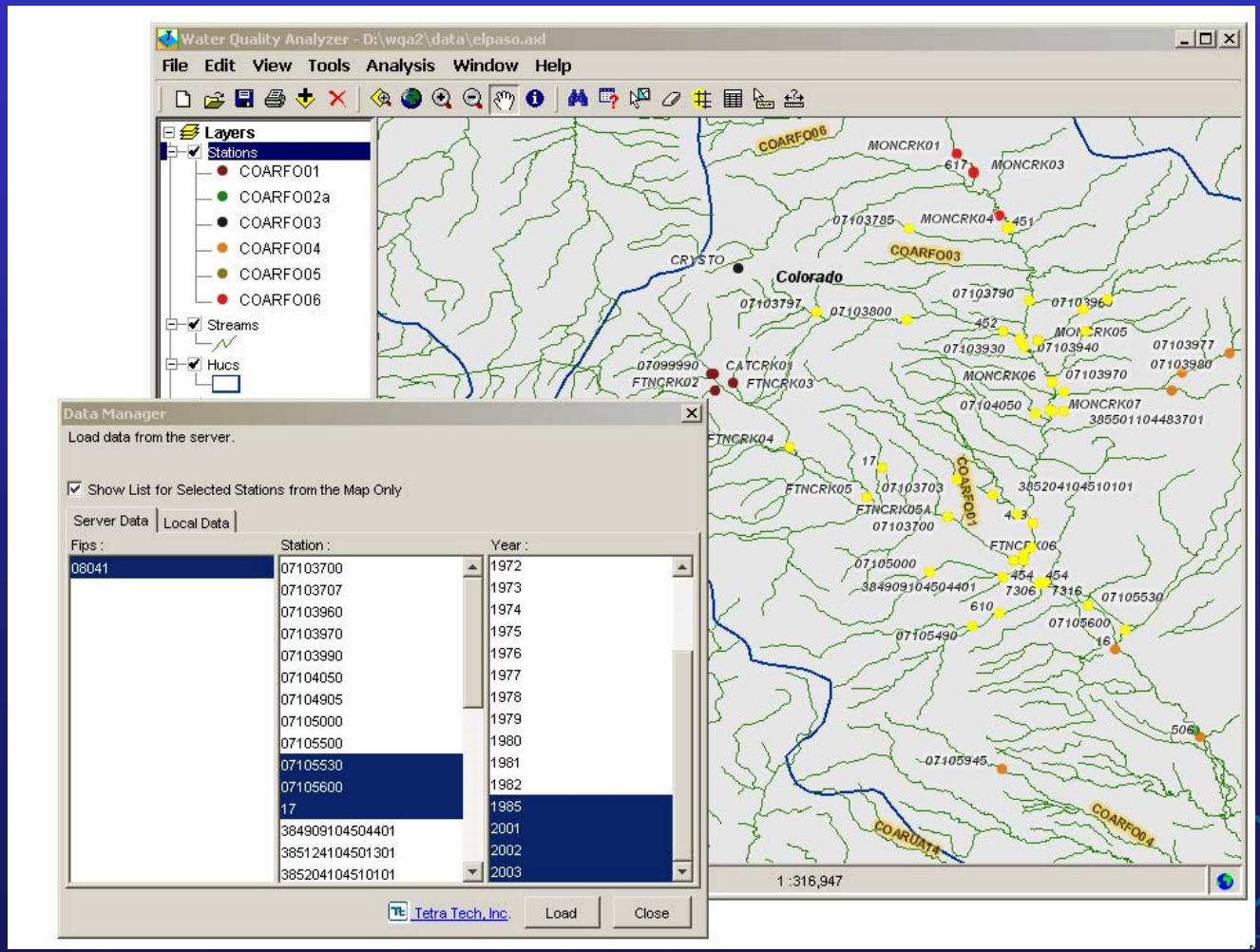
WQA Step 1 – Choose a Study Area



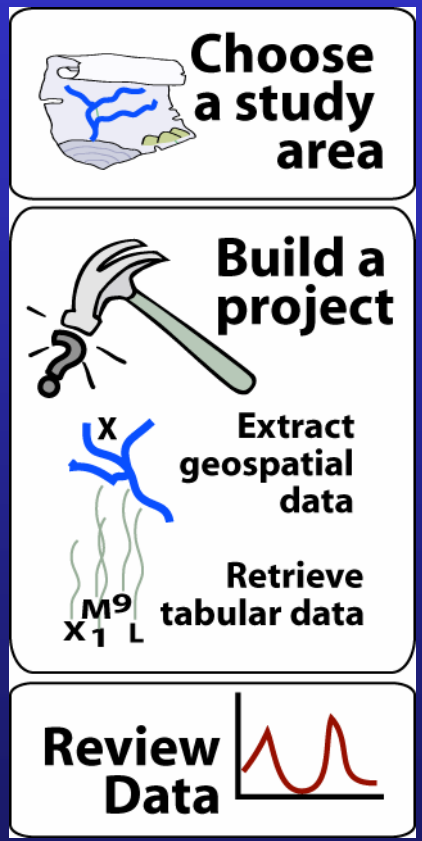


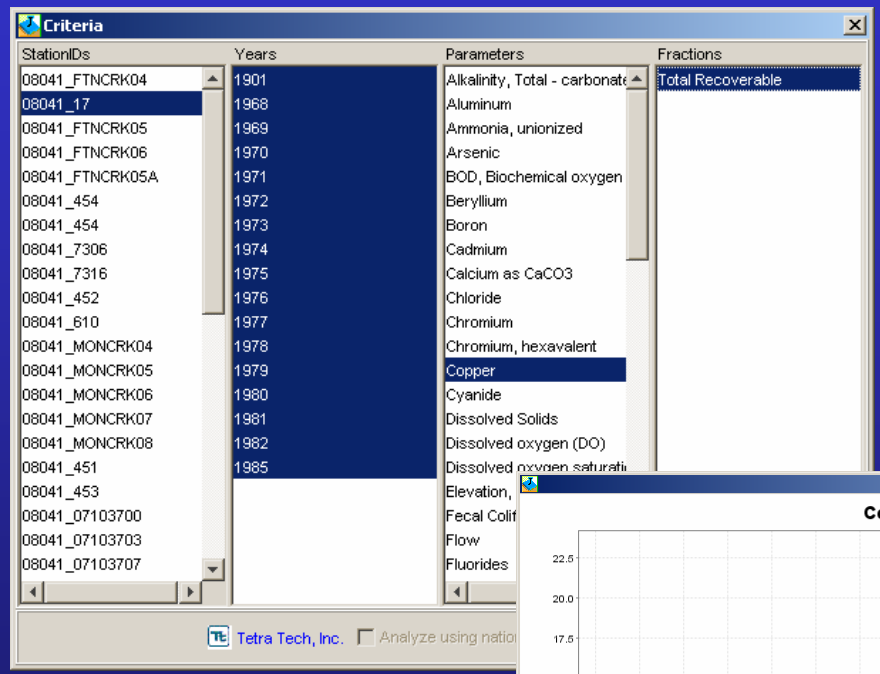
WQA Step 2 – Build a Project

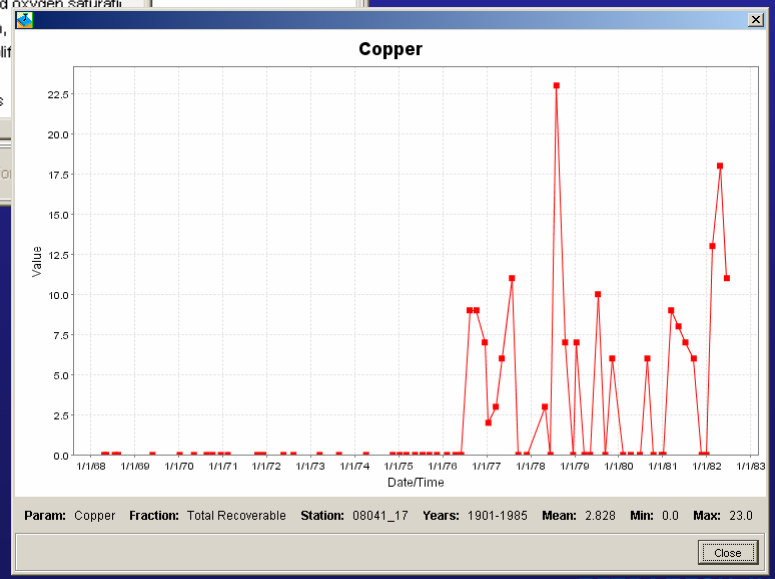




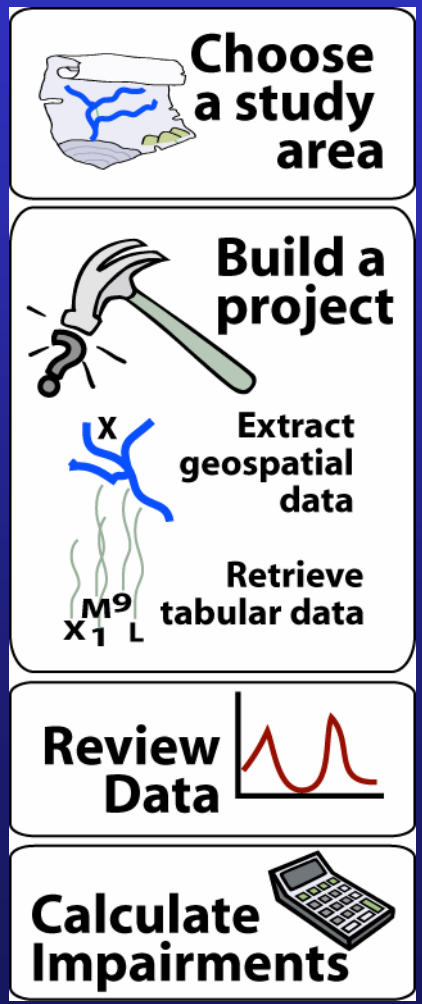
WQA Step 3 – Review Data







WQA Step 4 – Calculate Impairments



Entity Details

Entity ID: COARFO01

Param: Ammonia, unionized

Fraction:

Units: mg/l

Standard: value may not be > 0.02

Station ID	Date	Value
08041_17	1969-09-04	0.0405
08041_17	1975-07-17	0.0875
08041_17	1980-06-24	0.0222
08041_FTNCRK05	1985-08-08	0.0607
08041_17	1968-09-19	0.0033
08041_17	1968-10-03	0.0060
08041_17	1968-11-14	0.0
08041_17	1968-12-05	0.0027
08041_17	1969-01-30	0.0
08041_17	1969-04-23	0.0
08041_17	1969-05-28	0.0099

Results

Entity ID	Param	Fraction	Unit	Exceedan...	Samples	% Failed	Standard	Mean	Minimum	Maximum
COARFO01	Ammonia, unionized		mg/l	4	82	4.9%	>0.02	0.004	0.0	0.0875
COARFO01	Arsenic	Total	ug/l	0	56	0%	>50	1.196	0.0	34.0
COARFO01	Boron	Total	ug/l	0	56	0%	>750	29.214	0.0	130.0
COARFO01	Cyanide	Total	ug/l	4	6	66.7%	>0.005	0.035	0.0	0.18
COARFO01	Dissolved oxygen (DO)		mg/l	1	89	1.1%	<=6	9.927	5.7	13.0
COARFO01	Fecal Coliform		#/100ml	72	146	49.3%	>229	1,189.877	0.0	54000.0
COARFO01	Mercury	Total	ug/l	1	1	100%	>0.01	0.5	0.5	0.5
COARFO01	Nitrogen, Nitrate (NO3) as NO3	Total	mg/l	0	78	0%	>10	0.949	0.0	8.8
COARFO01	Nitrogen, Nitrite (NO2) as NO2	Total	mg/l	0	61	0%	>0.05	0.006	0.0	0.047
COARFO01	Selenium	Dissolved	ug/l	13	34	38.2%	>4.6	3.997	0.0	14.0
COARFO01	pH		ug/l	2	198	1%	>9	8.754	6.9	79.0
COARFO02a	Arsenic	Total Reco...	ug/l	0	15	0%	>50	3.4	1.0	10.0
COARFO02a	Arsenic	Total	ug/l	0	25	0%	>50	4	1.0	18.0
COARFO02a	Cyanide	Total	ug/l	3	6	50%	>0.005	0.005	0.0	0.01

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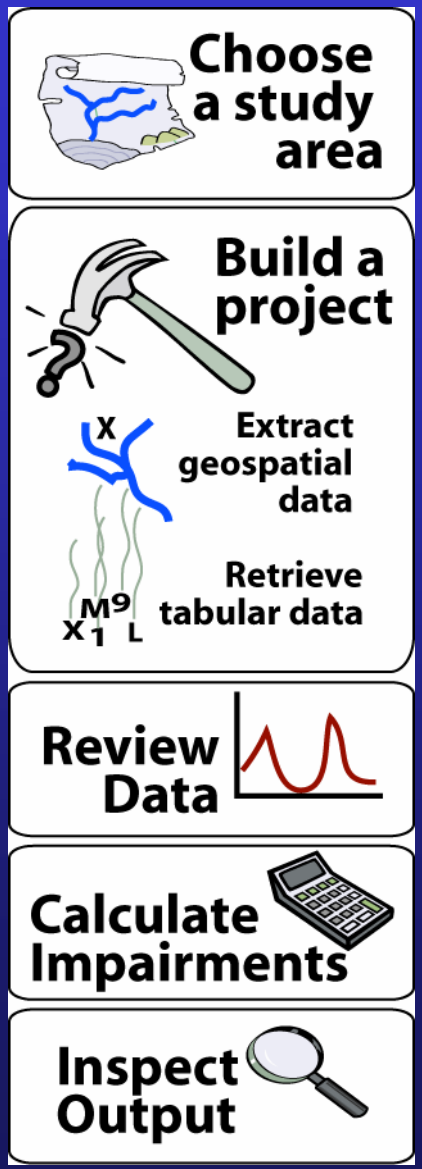
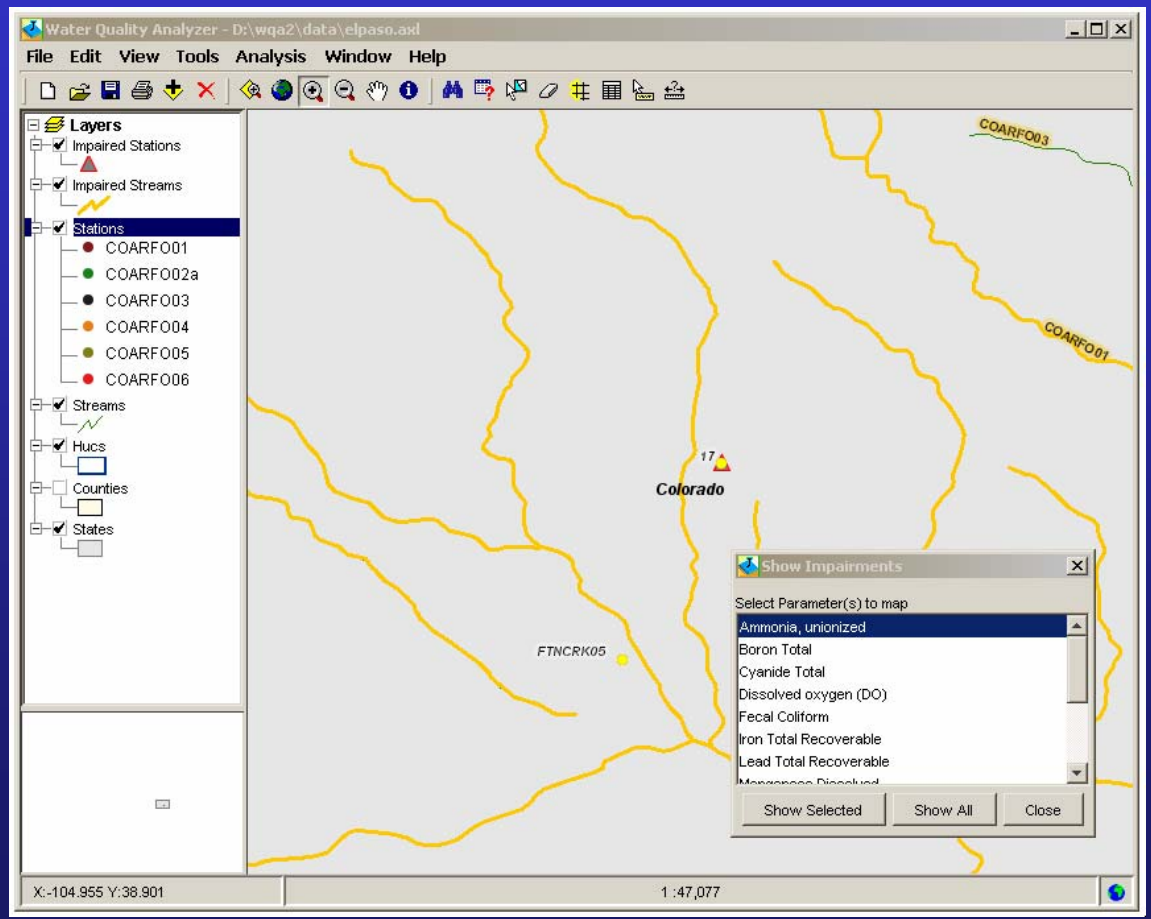
WQA Step 5 – Inspect Output





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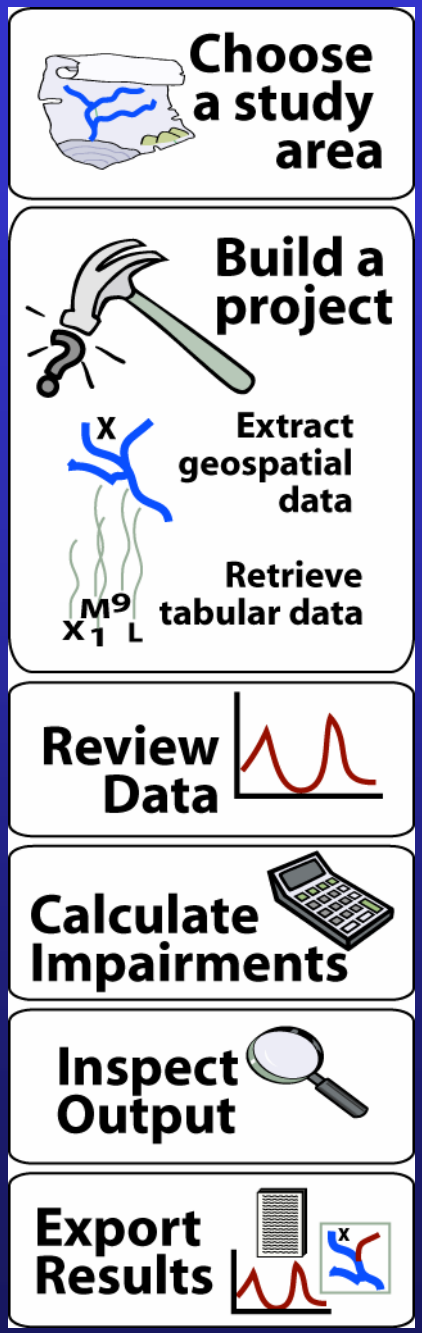
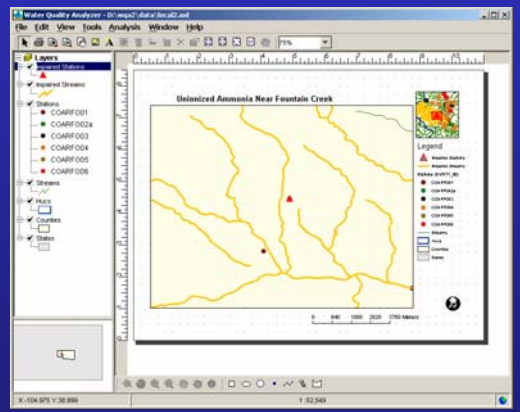
WQA Step 6 – Export Results





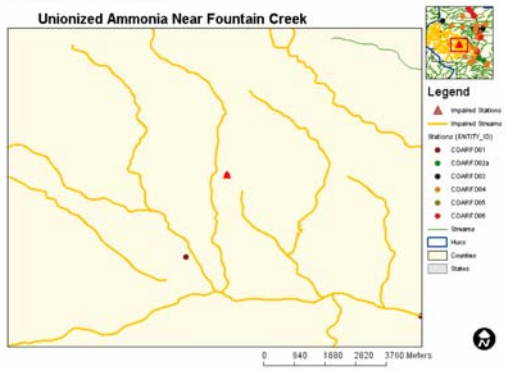
Total Results

Entity ID	Param	Fraction	Unit	No. Of Exceedances	Total Samples	Per Cent Failed	Standard	Mean Value	Min. Value	Max Value
COARFO01	Ammonia, unionized		mg/l	4	82	4.90%	>0.02	0.004	0	0.0875
COARFO01	Arsenic	Total	ug/l	0	56	0%	>50	1.196	0	34
COARFO01	Boron	Total	ug/l	0	56	0%	>750	29.214	0	130
COARFO01	Cyanide	Total	ug/l	4	6	66.70%	>0.005	0.035	0	0.18
COARFO01	Dissolved oxygen (DO)		mg/l	1	89	1.10%	<=6	9.927	5.7	13
COARFO01	Fecal Coliform		#/100ml	72	146	49.30%	>229	1,189.88	0	54000
COARFO01	Mercury	Total	ug/l	1	1	100%	>0.01	0.5	0.5	0.5
COARFO01	Nitrogen, Nitrate (NO3) as NO3	Total	mg/l	0	78	0%	>10	0.949	0	8.8

Unionized Ammonia – Fountain Creek

Ammonia, Unionized

########## EXCEEEDANCES ##########		
Station ID	Date	Value
08041_07103700	11/7/2002	0.01
08041_07103700	12/3/2002	0.01
08041_07103700	2/14/2003	0.01
08041_07103707	11/7/2002	0.18
########## OTHER SAMPLES ##########		
08041_07103707	12/5/2002	0
08041_07103707	2/13/2003	0



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Future Directions

- Establish Distribution Mechanism

Future Directions

- XML Linkage with Existing Data Sources
  - STORET, USGS NWIS
- Customization of Analysis Plug-ins for End Users
  - Impairment Analysis
    - Business Rules
    - Water Quality Standards
  - Others

Thank you

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703-385-6000

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